

invests our system with a halo of antiquarian interest derived from the standards of Imperial Rome. "I can see," says Mr. Wilson, with well-timed enthusiasm, "the spirit of the old Scots measures standing in an empty Linlithgow wheat flrot, with a wreath of golden ears around his brows, and looking ineffable scorn upon the statutes which affect to abolish his reign and his dynasty."

Those who want to know more must read the book. We next proceed to take a rapid glance at the objections to the bushel as a corn measure, or as a means of quantifying corn. These objections may be summarised as follows. First, the bushel lends itself easily to misrepresentation. It can be "shaken together, pressed down, running over." However exact as a measure of fluids it is not suitable for a compressible substance. The height from which a bushel is filled affects its amount; a blow upon its side during filling causes evident settlement, and finally we are not certain as to whether a heaped bushel or a struck bushel is always meant. Such is one class of objections. Another arises from the fact that, contrary to general opinion, Mr. Wilson holds, and we think proves, that weight per bushel is not an indication of quality. Samples may be readily "sweated," rubbed, beaten, or dressed, until the weight per bushel is not a fair indication of quality. Again, corn which has been swollen with exposure to rain does not return to its former bulk but remains permanently enlarged. Lacunæ or hollows filled with air remain, and the bushel is rendered lighter, although we cannot hold in such cases that the quality of the flour has been injured. Again, the shape of the grain has its effect in allowing some to pack closer together in the bushel while others lie looser. Lastly, in oats the proportion of kernel to husk varies immensely, and yet this is not indicated at all by weight per bushel. A very strong point is made with reference to moisture. We have generally considered, and with some truth, that the drier a sample of wheat is the heavier will it weigh in the bushel. This it appears is not to be relied upon, and in numerous experiments it was found that after moisture had been artificially driven off the "measure weight" or weight per bushel was less than before! Thus in one case "the measure weight with no moisture in the grain was nearly 4 lbs. less than at first, with 9.35 per cent. of moisture"! This is not by any means contrary to what might be expected. As long as wheat contracts in volume as it dries, so long will it increase in specific gravity. When, however, it reaches a stage at which the moisture evaporated is replaced by air occupying the spaces previously occupied with water—then will the weight per bushel suffer. Hence a very strong case is made out against the bushel and the quarter as standards for quantifying corn.

The question has a retrospective as well as a prospective interest. The bushel weighs differently every year. Thus, according to evidence laid before the Fiers Court in Aberdeenshire, the weight of a bushel of wheat was, in 1856, 57.02 lbs.; in 1857, 60.3 lbs.; in 1858, 61.32 lbs.; in 1860, 55.95 lbs.; and in 1868, 62.29 lbs. A bushel of wheat then between 1856 and 1868 was found to vary in weight by 6.34 lbs., or 50.72 lbs. per quarter of 8 bushels.

If wheat weighs 50.72 lbs. per quarter less one year than another, it will be found that as a standard of value the

quarter is misleading. A quarter of 430 lbs. is 10 per cent. in weight less than one of 493 lbs. Now if in a bad year the lighter wheat is quoted at 48s. per quarter, while in a succeeding good year the heavier wheat is quoted at 52s., wheat is said to have gone up 4s., whereas according to weight the prices are the same in both years.

Wheat may be dearer per quarter and yet be really selling at less money per cental. Hence the calculations made by statisticians as to the fluctuations in the wheat market have up to now all been made on a false basis. It would take us to undue length if we were next to show from this little volume why the *cental* is a better means of quantifying wheat than the bushel or quarter. That it is so we have no doubt whatever, and therefore consider that the book before us has done much to inaugurate the use of the *cental* and the abolition of the quarter in our corn markets.

JOHN WRIGHTSON

#### OUR BOOK SHELF

*Catalogue and Handbook of the Archaeological Collections in the Indian Museum.* Part I. Asoka and Indo-Scythian Galleries. By John Anderson. (Calcutta, 1883.)

THIS is a model of what a guidebook to a museum should be. The antiquities described by Prof. Anderson are of the highest interest, and the fullness and clearness of his description is worthy of them. The Indian Museum, though only founded in 1866, now contains a mine of wealth for the Indian archæologist. The collections of the Asiatic Society deposited in it have been enriched by the sculptures from Bharhut, the Gāndhāra bas-reliefs, the Buddha Gayā discoveries of the Archæological Survey, and the casts from the early temples of Orissa. A flood of light has been thrown on the history of ancient Buddhist art and belief, as well as upon the relations of Buddhist India with Greece and the west. The dome-shaped Stupa of Bharhut belongs to the second century B.C., and is adorned with sculptures representing scenes from the legendary life of Buddha; the ruins of Buddha Gayā have been excavated near the site of the famous Bodhi tree under which Buddha sat, and which was visited by the Chinese pilgrim Hiouen Tshang in 637 A.D., while the rock-cut temples of Orissa carry us back to a period still earlier in the life of Buddhism than that of Bharhut. In the Indo-Scythian Gallery the most interesting remains are those from Mathura (or Matra) and Gāndhāra. Here, too, the sculptures are partly Buddhist, though also partly Jain—Jainism itself being but an older form of Buddhism, if we are to believe Mr. Thomas. The chief interest attaching to them is due to the fact that many of them owe their inspiration to Græco-Roman—if not even Byzantine—art. The dress of several of the figures represented in them is also interesting as pointing to a northern climate. The same may be said of a group of figures at Sanchi, which have bandages round the legs like those still worn in Afghanistan.

In looking through this catalogue we cannot fail to be struck by the contrast between the care now taken by the Indian Government of the antiquities of the country, and the official neglect to which the ancient monuments of our own islands are exposed. To say nothing of the Archæological Survey, which has already done so much to bring to light the hidden treasures of early Indian art, no pains seem to be spared to protect the memorials of the past which are scattered over the surface of the soil. It is a pity that some little of the intelligent interest taken by the Indian Government in the historical monuments of India cannot be reflected on our rulers here. It is true that, fortunately for archæology, India is still governed by a small body of educated men, while an extended franchise

implies a majority which cares nothing for science and much "for the rights of property" and the prospect of increased dividends; nevertheless even the majority is willing to follow the leaders it has chosen, and the leaders will lose nothing if they remember that we have duties to perform towards the past as well as towards the present.

### LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

[The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.]

#### The Green Sun

THE appearance of a bright green sun for several days in succession seems to be a phenomenon sufficiently rare to deserve notice in your columns, so I send you the following notes on the subject:—

On Sunday evening, September 9, the sun for some time before setting appeared perfectly rayless and of a bright silvery-white colour, quite different from anything that I have ever seen before. On the following morning I did not observe it particularly, but in the evening I watched it carefully from about five o'clock till sunset. At first it had the same silvery-white appearance as on the previous day, and this continued till 5.30, when it was lost behind a bank of cloud; on its partial reappearance, however, at 5.43, the part visible between the clouds was of a bright pea-green colour. On Tuesday morning it was rather cloudy, but the appearance, when seen at all, was the same as on the preceding night. In the evening, however, it was a magnificent spectacle, and attracted the notice of every one. The silvery sheen was visible early in the afternoon, and the brightness of the sun rapidly faded, till by about five o'clock one could look at it directly without any difficulty. At this time there was a distinct tinge of green in the light when received on a sheet of white paper, while shadows were very prettily tinted with the complementary pink. As the sun sank towards the horizon the green became more and more strongly marked, and by 5.30 it appeared as a bright green disk, with a sharply-defined outline. In fact the definition was so good that a large spot (about 1' long) was a conspicuous object to the naked eye. On this occasion the sun was lost in a bank of clouds near the horizon, but on another occasion, when I was able to see it actually set, the colour got yellow rather than green close to the horizon. Similar, but less marked, were the appearances both at sunset and sunrise for several days, and before sunrise and after sunset the cloud effects were such as I have never before witnessed here. These cloud effects were chiefly remarkable for the brilliancy of the colouring and for the length of time that they were visible, being seen for nearly an hour after sunset. The moon and stars, when near the horizon, showed the same green colours as the sun.

On the 22nd the green sunrises and sunsets began again and continued for three days. I carefully examined the spectrum on every possible occasion with my zodiacal light spectroscope, as well as with a small direct-vision one. The spectrum showed clearly that aqueous vapour played a large part in the phenomena, for all the atmospheric lines usually ascribed to that substance were very strongly developed. But in addition to this there was a very marked general absorption in the red. Even an hour before sunset, and often longer, the absorption was complete as far as B, and the dark shade gradually crept up till it reached C, and at times even that line was invisible, while the absorption was clearly marked up to W.L. 621. At the blue end nothing could be seen beyond W.L. 428, and even that only with a very wide slit, but a photograph showed the lines clearly nearly as far into the ultra violet as on ordinary occasions. The phenomenon was visible over a large area of country, from Ceylon to Vizagapatam, and as far west as Aden. It was not, however, observed at all at the Bombay Observatory.

I am at present collecting information from various sources, and so do not care to enter into many details at present.

Most people ascribe the phenomena to the recent great eruption in Java, but there are difficulties in the way of accepting this

view, which I have not yet been able to get over, and the similar appearance of a blue sun over Europe and America in 1831 seems to make this explanation unnecessary, besides it is well known that the sun appears green under certain circumstances when seen through steam or even in a mist (Lockyer). On the other hand, observations referred to in NATURE, vol. xviii. p. 155, tend to show that very fine dust might produce the observed effects.

Can any of your readers refer me to Dr. Schuster's original papers?

It may not be without interest to add that on both occasions the green appearance was preceded by abnormal electrical conditions of the atmosphere. The potential of the air was strongly negative for a number of days in succession from about 9.30 a.m. to 2.30 p.m., with a clear sky and no rain within 100 miles.

C. MICHIE SMITH

Madras, October 10

I INCLOSE a letter giving an account of the green sun, which may be of interest to your readers. My correspondent is the wife of General Tremenhoe, formerly in the Indian army.

WARREN DE LA RUE

73, Portland Place, W., November 3

Spring Grove, Isleworth, November 2

IT may interest you to hear that my daughter, writing from Bellary, tells me that a gentleman who was at Ootacamund, in the Neilgherries, was on one of the higher peaks when the phenomenon of the sun took place in September, and he first distinctly saw a green, cloud-like mist pass across the sun, and then one of a reddish colour, and the sun took the colour of each of these clouds or mists. People at Ceylon were terribly alarmed at the unusual appearance of the sun.

S. S. T.

MR. GREAVES has the pleasure to forward to the Editor an extract from a letter just received from Mr. Beardmore at Madras, referring to the phenomenon of the green sun now being discussed in NATURE.

Sunhill, Clevedon, November 2

Harbour Works, Madras, October 10

WE have had the sun here for some weeks past in the mornings and evenings a most curious greenish blue colour, and generally casting a bluish beam of a most pretty tint. Mr. Pogson thinks it due to volcanic dust and sulphurous gases from the great eruption in Java. Another astronomer, Mr. H. Smith, thinks it due to a great amount of aqueous vapour.

NATHL. BERNARD BEARDMORE

#### The Division of the Circle

ALLOW me to point out an oversight in NATURE (vol. xxviii. p. 598), where, in explaining the divisions of a circle the following passage occurs: "In quite recent times it has been suggested that 400 parts should be taken in place of 360, but that is a suggestion which up to the present time has not been acted upon."

We probably owe our degrees either to the earlier supposed year of 360 days, or to the fact that this number has many divisors, although such divisors afford no practical advantage. When trigonometrical functions were subsequently discovered, it was found that the natural unit is not the circle, but the quadrant or right angle. Our system of numeration being decimal, it was then most convenient to divide the quadrant decimally, and the circle is thus considered as composed of 4, 40, 400, &c., parts according to the degree of exactness required. This was proposed by Briggs when preparing his logarithms, which are based on decimals, but unfortunately it was then set aside. Revived a long time after by Lagrange, it was acted upon by Laplace in his "Mécanique Céleste," being thus much more than a mere suggestion. Nowadays decimal divisions of the quadrant are the only ones used by French geodesists.

Facts are the grand supporters of argument. Will you kindly quote the following? After grumbling on the necessity of using the only circle at his disposal because it was divided decimally, a French civil engineer would afterwards employ no other: he found the decimal circle much more convenient. A special experiment had been already made in Italy, where two geodesists, carefully interchanged and inspected, had been instructed to